

Claims

What is claimed is:

1. A method for manufacturing an optical device comprising:
moving a mask situated between a layer of optical waveguide material to be shaped and a source of etchant ions, wherein the motion of the mask exposes at least two areas of the optical waveguide material to variable amounts of etchant ions, thereby causing vertical thickness variations between the at least two areas.
2. The method of claim 1, wherein the mask has a comb shape comprising teeth.
3. The method of claim 1, wherein the mask has a comb shape and wherein the mask comprises tapered teeth.
4. The method of claim 1, wherein the mask comprises at least one slit.
5. The method of claim 1, further comprising a stationary mask.
6. A vertically tapered waveguide produced by the method of claim 1.
7. A diffraction grating produced by the method of claim 1.
8. The method of claim 1, wherein the mask moves in a linear direction with respect to the plane of the optical waveguide direction.
9. The method of claim 1, wherein the mask moves with a reciprocating motion with respect to the plane of the optical waveguide direction.

10. A method of micromachining comprising:
etching through a moving mask so that a desired sidewall shape is produced in an optical material, wherein the moving mask is a comb mask comprising teeth and the motion is a reciprocating motion.
11. An optical device comprising:
a waveguide; and
a diffraction grating, wherein the waveguide and the diffraction filter are made from a monolithic optical material, and wherein the monolithic optical material is over a substrate common to both the waveguide and the diffraction grating.
12. The device of claim 11, wherein the waveguide is a vertically tapered waveguide.
13. The device of claim 12, wherein the diffraction grating is created on the vertically tapered waveguide.
14. A method for forming a waveguide with a vertical taper, comprising the steps of:
 - a) forming a waveguide;
 - b) disposing a movable mask above the waveguide;
 - c) moving the mask along the waveguide while exposing the waveguide to a directional etching process, so that a vertical taper is formed in the waveguide.
15. The method of claim 14 wherein the waveguide comprises silicon.
16. The method of claim 14 wherein the directional etching process is selected from the group consisting of deep reactive ion etching, plasma etching, ion beam milling, and laser-chemical etching.
17. The method of claim 14 wherein the mask is in contact with the waveguide.
18. The method of claim 14 wherein the mask is up to 250 microns above the waveguide.

19. The method of claim 14 wherein the mask is moved a distance of 50-1000 microns.
20. The method of claim 14 wherein the depth of the taper is in the range of 0-5 microns.
21. A vertically tapered waveguide made according to the method of claim 14.